

An Ocean Sunfish, *Mola lanceolata* (Liénard), in Malaysian waters

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(Plate I)

The Raffles Museum is indebted to Mr. Heng Chye Hee for an interesting donation; a specimen of one of the short ocean sun-fishes, *Mola lanceolata* (Liénard) was taken in a fishing-stake (*kelong*) during the night of 11th-12th April, 1932, off Noembing (a group of small islets near the island of Bintan) in the Rhio Archipelago.

Adult specimens of the genus *Mola*, owing partly to their bulk, and in part to the peculiarly watery nature of the fleshy parts, are difficult to preserve. A cast was therefore taken immediately after the specimen had been photographed. The specimen itself was treated with formalin and sun-dried.

The interest of the species lies in its rarity combined with a curiously wide distribution. In a note published in "Nature" (1) I gave a list of the known adult specimens. Whilst in Europe I have been able, through the courtesy of the Librarian of the Balfour Library at Cambridge, to consult Schmidt's comprehensive work (2) and am thus able to add two further specimens. The revised list is given below:—

1. The type, described by Liénard (3) in 1840, taken off Mauritius.
2. Another specimen from Mauritius (paratype).
3. A specimen taken off Amboina and described by Bleeker in 1873 as *Orthogoriscus oxyuropterus* (4), and regarded by him as probably synonymous with *O. lanceolatus*. It was included by Fowler (5) in the synonymy of *Masturus lanceolatus*.
4. A specimen in the collection of Klunzinger in the Berlin Museum, taken in the Red Sea (2).

5. A large specimen (2 metres in length) harpooned near the Azores by the Prince of Monaco and recorded by Collett (6) as an aberrant specimen of *Mola mola* which had retained the pointed tail as a larval characteristic.

6. A specimen in the Honolulu Museum recorded as *Masturus lanceolatus* by Jordan and Jordan (7). The authors refer to it as the third recorded specimen, and were evidently not acquainted with Schmidt's work. For a fuller account of this specimen reference may be made to Fowler's "Fishes of Oceania" (8).

7. The Rhio specimen, particulars of which are given here.

Allowing for slight damage to the tip of the tail, this specimen measured almost exactly four feet in total length. This is practically the same as the cast of the Honolulu specimen, and therefore presumably of the live fish; the length given by Fowler, 948 mm. or just over 3 feet is that of the spirit specimen, which has probably shrivelled very considerably. The following are measurements of the Rhio specimen:—

Total length	..	..	1,220 mm.
Depth	..	..	670 "
Head	..	..	335 "
Eye	..	..	55 "
Width of mouth	..	..	60 "
Gill opening	..	..	68 "
Interorbital width	..	..	175 "
Length of caudal fin	..	..	270 "
Base of caudal fin	..	..	540 "
Pectoral fin	..	..	135 "
Tip of dorsal to tip of anal	..	..	1,330 "

I was unable, as the fish was in the process of drying, to take a really accurate fin-count before leaving Singapore, but a rough count leads me to believe that the number of fin-rays is not notably different from that in the specimens recorded previously.

Colour.—Silvery, back dark blue-black extending on to the snout. Dorsal black; anal black shading to silvery at base; caudal grey with silvery spots a few of which extend also on to dorsal and anal.

In parts the thickness of the skin with its underlying layer of cartilage reached 37 mm. The flesh was of a peculiarly delicate character, strikingly white and tender. It disintegrated rapidly when scraped during the process of cleaning. There is

a temptation to draw attention to a resemblance to the delicate flesh of some deep-sea fishes, but evidence is all in favour of the sun-fishes dwelling near the surface, diving for food. If they are actually in the habit of spending considerable periods at great depths there may be an explanation of the delicate flesh, and the sudden changes of pressure on coming to the surface may be related to the peculiar development of subcutaneous cartilage.

Another feature of interest is the gill-opening. This is in the form of a short funnel, projecting backward. The suggestion put forward by Damant (9) that the gill-opening of *Mola mola* is used as an auxiliary steering apparatus by squirting out a jet of water probably applies with equal force to *M. lanceolata*. It is also possible that this modification is of use to the animal in diving.

Eels are said to form a large proportion of the diet of the sun-fishes, a taste doubtless developed owing to the fact that both groups are found breeding round about the same area, the Sargasso Sea. On the long voyages of the adults, however, the diet must vary considerably. The specimen under consideration contained a sucker-fish (*Echeneis remora* Linn.), eight inches in length.

The distribution of the few known adult specimens of *Mola lanceolata* is of peculiar interest. It is generally conceded that the sun-fishes of the family *Molidae* travel for considerable distances, drifting with the surface-currents of the ocean. Schmidt has found larvæ (2, 2a, 2b) which he considers to be those of *Mola lanceolata*, in the Sargasso Sea, where they are common. Although he has not bred a recognisable adult from the egg, there is every reason to believe that his conclusions are correct. With regard to the adults, it is of course difficult to say, without access to fresh material from each area, whether any minor distinctions exist. There is a possibility that we are concerned either with a number of separate species or with local races, but evidence points to a single race or species¹. We should therefore expect a single "nursery", as segregation tends to produce racial or specific variation.

Difficulties arise when we attempt to follow the probable route of the fish. All the specimens have so far been found in tropical or sub-tropical waters, but with the exception of the Azores specimen they would have had to pass through great changes of temperature on the voyage from the nursery to the place of capture. However, too much stress need not be laid on

¹ The possible exception is the specimen from the Azores, but the longer tail is probably a development associated with age or sex.

this fact, as *Mola mola* has been caught in both temperate and tropical latitudes. A resident of Singapore who spent his earlier years in Colombo testified to seeing sun-fishes regularly off the latter port: he believed them to belong to *M. lanceolata*, but the Colombo Museum possesses a specimen of *M. mola*, and Dr. Pearson tells me that the only other specimen he has seen there was also referable to that species. The sun-fishes may then be capable of withstanding considerable changes of temperature. If this point be conceded, and it is of course by no means proved, the route followed may be roughly as follows:—¹

From the Sargasso Sea the fishes will be carried eastward by the Gulf Stream (Azores specimen) and south by the Canaries Current, westward by the South Equatorial Current then south along the Brazilian coast. The West Wind Drift then bears the fishes eastward almost to the Australian coast where some specimens are once more caught up in the South Equatorial Stream (Mauritius specimens), the North-East Monsoon possibly playing a part in deciding the ultimate destination of wanderers such as that found in the Red Sea: others are borne north of Australia, finding their way into the quieter waters of the East Indian Archipelago (Amboina and Rhio specimens). Others may remain in the West Wind Drift until they are borne north along the South American coast, the equatorial streams passing them from one hemisphere to another until they reach the Central Pacific (Honolulu specimen).

The alternative of local nurseries can only be determined by the results of plankton-investigation. Unfortunately little has yet been done in this area, but a comparison with Schmidt's work on freshwater eels is suggested by the fact that the western eel nurseries practically coincide with that of the sun-fishes. In such a case the most likely breeding-ground for an East-Indian race of *Mola lanceolata* would be in the neighbourhood of the Mentawi Basin off the West Coast of Sumatra.

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1. Reference should be made to Schott's chart (10), as it is impossible to reproduce a satisfactory modification here.

REPORT ON THE CEPHALOPODA IN THE RAFFLES MUSEUM

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Mola lanceolata from the Rhio Archipelago.